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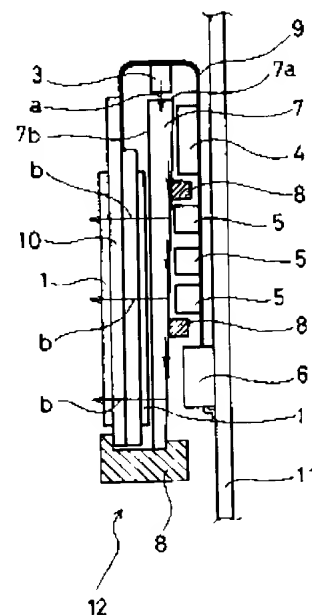
最終頁に続く

(54) 【発明の名称】 液晶表示装置

(57) 【要約】

【課題】 充分な明るさで液晶パネルを透過照明できる液晶表示装置を提供する。

【解決手段】 プリント配線基板11にフレキシブル配線基板9を介して液晶パネル10が接続され、プリント配線基板11の情報を液晶パネル10に表示する液晶表示装置12において、液晶パネル10がプリント配線基板11の実装面に重なるようにフレキシブル配線基板9を折り曲げて実装するとともに、液晶パネル10の背面とプリント配線基板11の間には、光入射端面7aがフレキシブル配線基板9の折り曲げ部分に近接し、光出射面7bが液晶パネル10の背面に近接して対向する導光板7を設け、フレキシブル配線基板9の折り曲げ部分には、導光板7の光入射端面7aに向かって光を出射する光源を設ける。



(2)

特開2000-98415

1

【特許請求の範囲】

【請求項1】プリント配線基板上にフレキシブル配線基板を介して液晶パネルが接続され、プリント配線基板の情報を液晶パネルに表示する液晶表示装置において、液晶パネルがプリント配線基板の実装面に重なるようにフレキシブル配線基板を折り曲げて実装するとともに、液晶パネルの背面とプリント配線基板の間には、光入射端面がフレキシブル配線基板の折り曲げ部分に近接し、光出射面が液晶パネルの背面に近接して対向する導光板を設け、

フレキシブル配線基板の折り曲げ部分には、導光板の光入射端面に向かって光を出射する光源を設けた液晶表示装置。

【請求項2】プリント配線基板上にフレキシブル配線基板を介して液晶パネルが接続され、プリント配線基板の情報を液晶パネルに表示する液晶表示装置において、液晶パネルがプリント配線基板の実装面に重なるようにフレキシブル配線基板を折り曲げて実装するとともに、液晶パネルの背面とプリント配線基板の間には、光入射端面がフレキシブル配線基板の折り曲げ部分に近接し、光入射面が液晶パネルの背面に近接して対向する導光板を設け、

プリント配線基板には、導光板の光入射端面に向かって光を出射する光源を設けた液晶表示装置。

【請求項3】フレキシブル配線基板には、液晶パネルの駆動回路を構成し、

液晶パネルの背面とフレキシブル配線基板に構成された液晶パネルの駆動回路との間に導光板を配設した請求項1、請求項2のいずれかに記載の液晶表示装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、プリント配線基板上にフレキシブル配線基板を介して液晶パネルが接続され、プリント配線基板の情報を液晶パネルに表示する液晶表示装置に関するものである。

【0002】

【従来の技術】携帯電話などの小型携帯機器においては、従来の仮名文字表示よりも読みやすい漢字文字表示の要望が高まっている。

【0003】このような要望に対応するためには、表示容量を増大する必要があり、表示容量の増大は表示ドューティの縮小につながる。具体的には1/2.6～1/3.3ドューティから1/4.8～1/6.5ドューティへの縮小が求められている。

【0004】図5と図6は、液晶パネルの駆動回路をフレキシブル配線基板に実装した従来の液晶表示装置を示す。図5(a)は組み立てた仕上がり形状で、図6(a)、(b)は展開状態を示している。

【0005】液晶表示装置12は、プリント配線基板11の情報を液晶パネル10に表示するために、プリント

2

配線基板11と液晶パネル10とをフレキシブル配線基板9を介して接続し、液晶パネル10を図5(a)に示すように、プリント配線基板11の実装面に重なるようにフレキシブル配線基板9を折り曲げて実装することにより構成されている。

【0006】液晶パネル10は半透過タイプのものであるため、補助的なバックライト機能が必要であり、光源として発光ダイオード3をプリント配線基板11に実装し、この発光ダイオード3から射出した光が図5(b)に示すように樹脂ケース8に組み込まれた反射シート付き導光板7(以下「導光板」と称す。)を介して液晶パネル10の背面から液晶パネル10を透過照明している。

【0007】詳しくは、図5(a)、(b)に示すように、フレキシブル配線基板9の一端には、両面に偏光板1の設けられた液晶パネル10を配置し、液晶パネル10の出力端子接続部2とフレキシブル配線基板9とを異方性導電樹脂を用いて熱圧着して接続している。

【0008】フレキシブル配線基板9の他端は、入力コネクタ6を介してプリント配線基板11と接続されており、前記プリント配線基板11に発光ダイオード3が複数実装されている。この発光ダイオード3は、後述の液晶パネル10の駆動ドライバー4の出力端子と接続されている。

【0009】また、フレキシブル配線基板9の入力コネクタらと出力端子接続部2との間には、液晶パネル10を駆動する駆動ドライバー4と回路部品5とからなる駆動回路が形成されている。

【0010】駆動回路は、液晶パネル10の表示部に相当するコセン及びセグメントの透明電極と接続されているため、プリント配線基板11からの情報が液晶パネル10に表示される。

【0011】回路部品5は具体的には、昇圧のためのコンデンサ、温度補償のためのサーミスタ、高圧設定のための固定抵抗器、液晶パネルや駆動ドライバーの昇圧バラキの補正用の半固定抵抗器などである。このように回路部品5をフレキシブル配線基板9に実装することにより、駆動ドライバー用の入力端子数を30～45本前後から10～20本前後に少なくすることができ、入力コネクタ6のサイズを小さくすることができる。

【0012】

【発明が解決しようとする課題】上記のように構成された液晶表示装置では、発光ダイオード3からの光は図5(a)、(b)に示す経路にて導光板7に入射する。

【0013】すなわち、発光ダイオード実装部3から発光された光は、矢印cで示すように導光板7に入射し、矢印dに示すように導光板7の一端の斜めにカットされた端面7dを突き抜けて樹脂ケース8の反射面8aで反射され、矢印eで示すように再度導光板の端面7dに入り、矢印fで示すように直進し、導光板7のプリン

(3)

特開2000-98415

3

4

ト配線基板11側の端面7eにて反射され、矢印gで示すように導光板の光出射端面7fを突き抜け液晶パネル10を照明する。

【0014】このように一旦導光板7を突き抜けた光を樹脂ケース8の反射面8aで反射させて液晶パネル10を照明するため、十分な明るさを得ることが出来ないという問題がある。

【0015】本発明は前記問題を解決し、充分な明るさで液晶パネルを透過照明できる液晶表示装置を提供するものである。

【0016】

【課題を解決するための手段】本発明の液晶表示装置は、液晶パネルを照らす光源を導光板の光入射端面に近接させて配設したことを特徴とする。

【0017】この本発明によると、液晶パネルを充分な明るさにて照明することかでき、表示品質の良い液晶表示装置を提供することかできる。

【0018】

【発明の実施の形態】請求項1記載の液晶表示装置は、プリント配線基板にフレキシブル配線基板を介して液晶パネルが接続され、プリント配線基板の情報を液晶パネルに表示する液晶表示装置において、液晶パネルがプリント配線基板の実装面に重なるようにフレキシブル配線基板を折り曲げて実装するとともに、液晶パネルの背面とプリント配線基板の間には、光入射端面がフレキシブル配線基板の折り曲げ部分に近接し、光出射面が液晶パネルの背面に近接して対向する導光板を設け、フレキシブル配線基板の折り曲げ部分には、導光板の光入射端面に向かって光を出射する光源を設けたことを特徴とする。

【0019】請求項2記載の液晶表示装置によると、プリント配線基板にフレキシブル配線基板を介して液晶パネルが接続され、プリント配線基板の情報を液晶パネルに表示する液晶表示装置において、液晶パネルがプリント配線基板の実装面に重なるようにフレキシブル配線基板を折り曲げて実装するとともに、液晶パネルの背面とプリント配線基板の間には、光入射端面がフレキシブル配線基板の折り曲げ部分に近接し、光入射面が液晶パネルの背面に近接して対向する導光板を設け、プリント配線基板には、導光板の光入射端面に向かって光を出射する光源を設けたことを特徴とする。

【0020】請求項3記載の液晶表示装置によると、請求項1または請求項2のいずれかにおいて、フレキシブル配線基板には、液晶パネルの駆動回路を構成し、液晶パネルの背面とフレキシブル配線基板に構成された液晶パネルの駆動回路との間に導光板を配設したことを特徴とする。

【0021】以下、本発明の実施の形態について図1～図4を用いて説明する。なお、上記従来例を示す図5、図らと同様をなすものについては同一の符号を付けて説

明する。

【0022】（実施の形態1）図1と図2は本発明の（実施の形態1）を示し、図1は組み立て仕上がり形状で、図2（a）、（b）は展開状態を示している。

【0023】上記従来例を示す図5、図6とはほぼ同様の構成であるが、この（実施の形態1）では、光源としての発光ダイオード3を、プリント配線基板11ではなくフレキシブル配線基板9に実装した点で異なる。

【0024】すなわち、この（実施の形態1）では、図1に示すように、フレキシブル配線基板9の折り曲げ部に発光ダイオード3を実装し、導光板7は液晶パネル10とプリント配線基板11との間で、さらに詳しくは、フレキシブル配線基板9と液晶パネル10の間にこの導光板7が、光入射端面7aを発光ダイオード3に近接して配置されている。

【0025】このような構成とすることで、発光ダイオード3からの光は、矢印aで示すように直接導光板の光入射端面7aに入射し、端面7bで反射されて矢印bで示すように光出射端面7cから出射して液晶パネル10を背面から透過照明する。

【0026】従って、従来よりも充分に明るく液晶パネル10を照射することかできる。また、図2（a）、（b）に示すように、発光ダイオード3は、フレキシブル配線基板9の折り曲げ部分、すなわち出力端子接続部2と駆動ドライバ4との間に直接実装されているため、実装コストは従来の液晶表示装置とほとんど同じで生産可能となる。

【0027】なお、発光ダイオード3の高極は、フレキシブル配線基板9が両面フレキシブル配線基板の場合には、前記基板のスルホール部を介して入力コネクタ6に配線接続され、片面フレキシブル配線基板の場合には、駆動ドライバ4部の配線を介して入力コネクタ6に配線接続される。

【0028】また、上記（実施の形態1）では、発光ダイオード3を直接フレキシブル配線基板9に実装したか、本発明はこれに限定されるものではなく、図3に示すように単一のプリント基板13に複数の発光ダイオード3を実装し、このプリント基板13をフレキシブル配線基板9に実装しても同様の効果が得られる。

【0029】（実施の形態2）図4は、本発明の（実施の形態2）を示す。上記（実施の形態1）を示す図1とはほぼ同様の構成であるが、この（実施の形態2）では、フレキシブル配線基板9の折り曲げ部の内側ではなく外側に発光ダイオード3を設け、導光板7の光入射端面7aに向かって光を出射するように構成した点で異なる。

【0030】すなわち、プリント配線基板11にフレキシブル配線基板9を介して液晶パネル10を接続し、液晶パネル10がプリント配線基板11の実装面に重なるようにフレキシブル配線基板9を折り曲げて実装し、液晶パネル10の背面とプリント配線基板11の間に光入

(4)

特開2000-98415

6

射端面7aからフレキシブル配線基板9の折り曲げ部分に近接し、光入射面が液晶パネル10の背面に近接して対向する導光板7を介装して液晶表示装置12を構成する。

【0031】そして、フレキシブル配線基板9の折り曲げ部の外側に、導光板7の光入射端面7aに向かって光を出射する光源が形成されるようにプリント配線基板11に発光ダイオード3を実装する。

【0032】その際、折り曲げ部を構成するフレキシブル配線基板9を透光性あるいは光入射端面7aと発光ダイオード3との間に位置するフレキシブル配線基板9に光の透過孔を設けることで、光源からの光はさらに導光板7に入射しやすくなり、一層明るく液晶パネルを照射することができる。

【0033】

【発明の効果】以上のように本発明の液晶表示装置によると、液晶パネルを照らす光源を導光板の光入射端面に近接させるため、充分な明るさの照明とすることができる。

【0034】このような液晶表示装置は、表示品質が良くしかも安価に製造できるため、携帯電話などに好適に使用することができる。

【図面の簡単な説明】

【図1】（実施の形態1）における液晶表示装置の断面図

*図

【図2】（実施の形態1）における液晶表示装置を展開した側面図および平面図

【図3】（実施の形態1）における別の液晶表示装置の断面図

【図4】（実施の形態2）における液晶表示装置の断面図

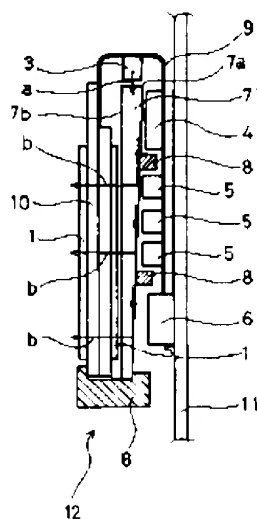
【図5】従来の液晶表示装置の断面図および要部拡大図

【図6】従来の液晶表示装置を展開した側面図および平面図

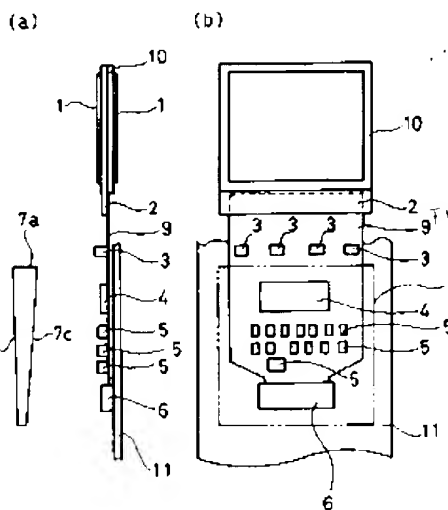
【符号の説明】

- | | |
|----|------------|
| 1 | 偏光板 |
| 2 | 出力端子接続部 |
| 3 | 発光ダイオード |
| 4 | 駆動ドライバー |
| 5 | 回路部品 |
| 6 | 入力コネクタ |
| 7 | 導光板 |
| 8 | 樹脂ケース |
| 9 | フレキシブル配線基板 |
| 10 | 液晶パネル |
| 11 | プリント配線基板 |
| 12 | 液晶表示装置 |
| 13 | プリント基板 |

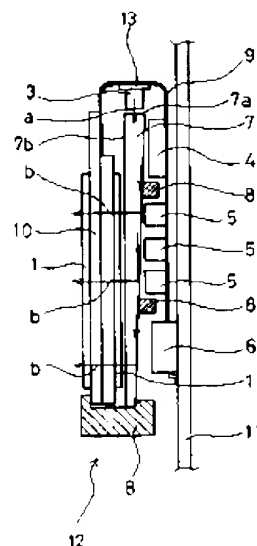
【図1】



【図2】



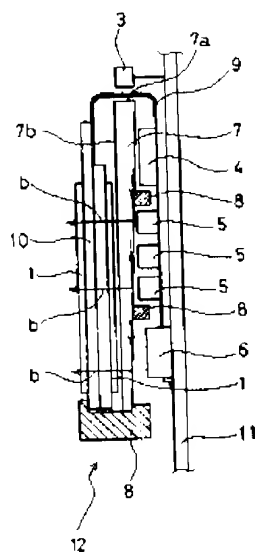
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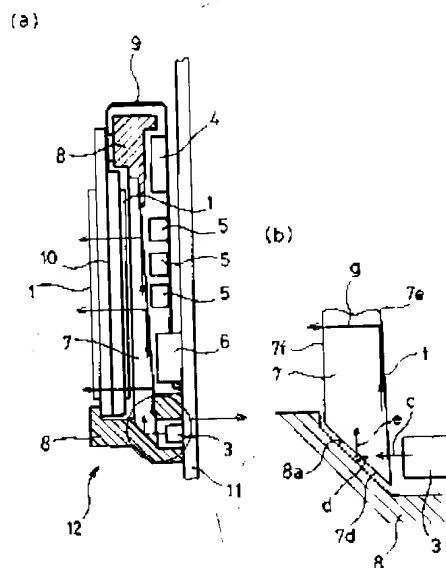
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特開2000-98415

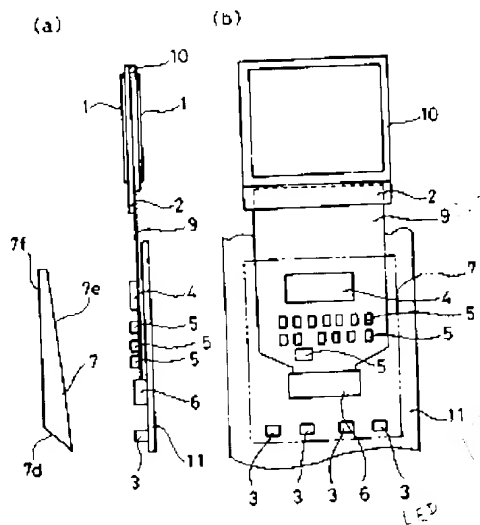
【図4】



【図5】



【図6】



(6)

特開2000-98415

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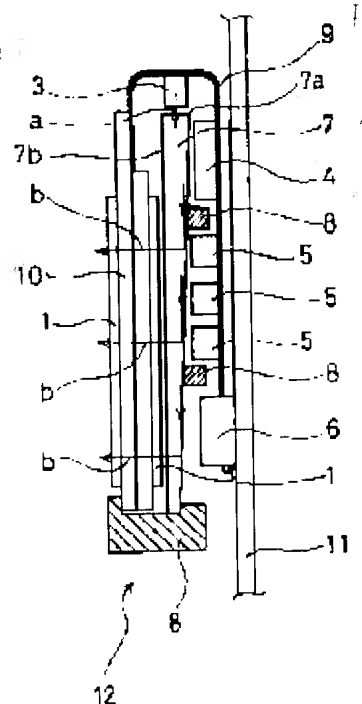
(72)Inventor : SANO MITSURU

(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a liq. crystal display device capable of transmission-lighting a liq. crystal panel with sufficient brightness.

SOLUTION: This liq. crystal display device 12 is provided with a liq. crystal panel 10 connected to a printed wiring board 11 with a flexible wiring board 9 and displays information of the wiring board 11 on the liq. crystal panel 10. In the display device 12, the flexible wiring board 9 is mounted in bending so as to be laid over the mounted surface of the printed wiring board 11 and in between a back side of the liq. crystal panel 10 and the printed wiring board 11, a light transmission plate 7 is arranged with a light incident end part 7a arranged closely to the bended part of the flexible wiring board 9 and with a light emitting face 7b arranged closely and opposite to the back side of the liq. crystal panel 10, and further a light source emitting light toward the light incident end part 7a of the light transmission plate 7 is mounted in a bent part of the flexible printed wiring board 9.



LEGAL STATUS

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[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]

[Claim 1] In the liquid crystal display which a liquid crystal panel is connected to a printed-circuit board through a flexible wiring substrate, and displays the information on a printed-circuit board on a liquid crystal panel While bending and mounting a flexible wiring substrate so that a liquid crystal panel may lap with the component side of a printed-circuit board, between the tooth back of a liquid crystal panel, and a printed-circuit board The liquid crystal display which the optical incidence end face approached the bending portion of a flexible wiring substrate, prepared the light guide plate with which an optical outgoing radiation side approaches and counters the tooth back of a liquid crystal panel, and prepared the light source which carries out outgoing radiation of the light to the bending portion of a flexible wiring substrate toward the optical incidence end face of a light guide plate.

[Claim 2] In the liquid crystal display which a liquid crystal panel is connected to a printed-circuit board through a flexible wiring substrate, and displays the information on a printed-circuit board on a liquid crystal panel While bending and mounting a flexible wiring substrate so that a liquid crystal panel may lap with the component side of a printed-circuit board, between the tooth back of a liquid crystal panel, and a printed-circuit board The liquid crystal display which the optical incidence end face approached the bending portion of a flexible wiring substrate, prepared the light guide plate with which optical plane of incidence approaches and counters the tooth back of a liquid crystal panel, and prepared the light source which carries out outgoing radiation of the light to a printed-circuit board toward the optical incidence end face of a light guide plate.

[Claim 3] A liquid crystal display given in the claim 1 which arranged the light guide plate between the drive circuits of the liquid crystal panel which constituted the drive circuit of a liquid crystal panel in the flexible wiring substrate, and was constituted by the tooth back and flexible wiring substrate of a liquid crystal panel, or a claim 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] A liquid crystal panel is connected to a printed-circuit board through a flexible wiring substrate, and this invention relates to the liquid crystal display which displays the information on a printed-circuit board on a liquid crystal panel.

[0002]

[Description of the Prior Art] In small pocket devices, such as a cellular phone, the requests of a kanji-character display more readable than the conventional Japanese-syllabary character representation are mounting.

[0003] In order to correspond to such a request, it is necessary to increase display capacity and increase of display capacity leads to reduction of display duty. Specifically, the reduction to $1/[1/48 -]$ 65 duty from $1/[1/26 -]$ 33 duty is called for.

[0004] Drawing 5 and drawing 6 show the conventional liquid crystal display which mounted the drive circuit of a liquid crystal panel in the flexible wiring substrate. Drawing 5 (a) is the assembled result configuration, and drawing 6 (a) and (b) show the expansion state.

[0005] In order to display the information on a printed-circuit board 11 on a liquid crystal panel 10, a liquid crystal display 12 connects a printed-circuit board 11 and a liquid crystal panel 10 through the flexible wiring substrate 9, and is constituted by bending the flexible wiring substrate 9 and mounting a liquid crystal panel 10 so that it may lap with the component side of a printed-circuit board 11 as shown in drawing 5 (a).

[0006] Since a liquid crystal panel 10 is a half-transparency type thing, it needs an auxiliary back light function, mounts light emitting diode 3 in a printed-circuit board 11 as the light source, and is carrying out transmitted illumination of the liquid crystal panel 10 from the tooth back of a liquid crystal panel 10 through the light guide plate 7 (a "light guide plate" is called below.) with a reflective sheet built into the resin case 8 as the light which carried out outgoing radiation from this light emitting diode 3 showed drawing 5 (b).

[0007] In detail, as shown in drawing 6 (a) and (b), the liquid crystal panel 10 with which the polarizing plate 1 was formed in both sides has been arranged, and thermocompression bonding of the output terminal connection 2 and the flexible wiring substrate 9 of a liquid crystal panel 10 was carried out to the end of the flexible wiring substrate 9 using the anisotropy electric conduction resin, and it has connected with it.

[0008] The other end of the flexible wiring substrate 9 is connected with the printed-circuit board 11 through the input connector 6, and two or more light emitting diodes 3 are mounted in the aforementioned printed-circuit board 11. This light emitting diode 3 is connected with the output terminal of the drive driver 4 of the below-mentioned liquid crystal panel 10.

[0009] Moreover, between the input connector 6 of the flexible wiring substrate 9, and the output terminal connection 2, the drive circuit which consists of a drive driver 4 which drives a liquid crystal panel 10, and passive circuit elements 5 is formed.

[0010] Since [by which a drive circuit is equivalent to the display of a liquid crystal panel 10] it connects with the transparent electrode of common and a segment, the information from a printed-circuit board 11 is displayed on a liquid crystal panel 10.

[0011] Specifically, passive circuit elements 5 are a fixed resistor for the thermistor for the capacitor for a pressure up, and temperature compensation, and a voltage setup, a liquid crystal panel, the semipermanent resistor for an amendment of the pressure-up variation of a drive driver, etc. Thus, by mounting passive circuit elements 5 in the flexible wiring substrate 9, the number of input terminals for drive drivers can be lessened before and after 10-20 from 30-45 order, and size of the input connector 6 can be made small.

[0012]

[Problem(s) to be Solved by the Invention] With the liquid crystal display constituted as mentioned above, incidence of the light from light emitting diode 3 is carried out to a light guide plate in the path shown in drawing 5 (a) and (b) 7.

[0013] Namely, the light which emitted light from the light emitting diode mounting section 3 As Arrow c shows first, carry out incidence to a light guide plate 7, and run through 7d of end faces cut across the end of a light guide plate 7 as shown in Arrow d, and it is reflected by reflector 8a of the resin case 8. As go into 7d of end faces of a light guide plate again as Arrow e shows, it goes straight on as Arrow f shows, and it is reflected in end-face 7e by the side of the printed-circuit board 11 of a light guide plate 7 and Arrow g shows, it runs through 7f of optical outgoing radiation end faces of a light guide plate, and a liquid crystal panel 10 is illuminated.

[0014] Thus, since the light which once ran through the light guide plate 7 is reflected by reflector 8a of the resin case 8 and a liquid crystal panel 10 is irradiated, there is a problem that sufficient luminosity cannot be obtained.

[0015] this invention solves the aforementioned trouble and offers the liquid crystal display which can carry out transmitted illumination of the liquid crystal panel in sufficient luminosity.

[0016]

[Means for Solving the Problem] The liquid crystal display of this invention is characterized by having made the light source which illuminates a liquid crystal panel approach the optical incidence end face of a light guide plate, and arranging it.

[0017] According to this this invention, a liquid crystal panel can be illuminated with sufficient luminosity, and a liquid crystal display with sufficient display quality can be offered.

[0018]

[Embodiments of the Invention] In the liquid crystal display with which it connects with a printed-circuit board, and, as for a liquid crystal display according to claim 1, a liquid crystal panel displays the information on a printed-circuit board on it through a flexible wiring substrate at a liquid crystal panel While bending and mounting a flexible wiring substrate so that a liquid crystal panel may lap with the component side of a printed-circuit board, between the tooth back of a liquid crystal panel, and a printed-circuit board It is characterized by for the optical incidence end face having approached the bending portion of a flexible wiring substrate, having prepared the light guide plate with which an optical outgoing radiation side approaches and counters the tooth back of a liquid crystal panel, and preparing the light source which carries out outgoing radiation of the light to the bending portion of a flexible wiring substrate toward the optical incidence end face of a light guide plate.

[0019] In the liquid crystal display which according to the liquid crystal display according to claim 2 a liquid crystal panel is connected to a printed-circuit board through a flexible wiring substrate, and displays the information on a printed-circuit board on a liquid crystal panel While bending and mounting a flexible wiring substrate so that a liquid crystal panel may lap with the component side of a printed-circuit board, between the tooth back of a liquid crystal panel, and a printed-circuit board It is characterized by for the optical incidence end face having approached the bending portion of a flexible wiring substrate, having prepared the light guide plate with which optical plane of incidence approaches and counters the tooth back of a liquid crystal panel, and preparing the light source which carries out outgoing radiation of the light to a printed-circuit board toward the optical incidence end face of a light

guide plate.

[0020] According to the liquid crystal display according to claim 3, in either a claim 1 or the claim 2, the drive circuit of a liquid crystal panel is constituted in a flexible wiring substrate, and it is characterized by arranging a light guide plate between the tooth back of a liquid crystal panel, and the drive circuit of the liquid crystal panel constituted by the flexible wiring substrate at it.

[0021] Hereafter, the gestalt of operation of this invention is explained using drawing 1 - drawing 4. In addition, the same sign is attached and explained about what makes drawing 5 and drawing 6 which show the above-mentioned conventional example, and this appearance.

[0022] (Gestalt 1 of operation) Drawing 1 and drawing 2 show the (gestalt 1 of operation) of this invention, drawing 1 assembles, it is a result configuration and drawing 2 (a) and (b) show the expansion state.

[0023] although it is the almost same composition as drawing 5 and drawing 6 which show the above-mentioned conventional example -- this (gestalt 1 of operation) -- **** -- it differs in that light emitting diode 3 as the light source was mounted in the flexible wiring substrate 9 instead of a printed-circuit board 11

[0024] namely, -- this (gestalt 1 of operation) -- **** -- as shown in drawing 1, light emitting diode 3 is mounted in the bending section of the flexible wiring substrate 9, between the liquid crystal panel 10 and the printed-circuit board 11, in more detail, between the flexible wiring substrate 9 and the liquid crystal panel 10, this light guide plate 7 approaches optical incidence end-face 7a at light emitting diode 3, and the light guide plate 7 is arranged

[0025] By considering as such composition, as Arrow a shows, incidence of the light from light emitting diode 3 is carried out to optical incidence end-face 7a of a direct light guide plate, as it is reflected by end-face 7c and Arrow b shows, outgoing radiation of it is carried out from optical outgoing radiation end-face 7b, and it carries out transmitted illumination of the liquid crystal panel 10 from a tooth back.

[0026] Therefore, a liquid crystal panel 10 can be irradiated more brightly enough than before. Moreover, as shown in drawing 2 (a) and (b), since light emitting diode 3 is directly mounted between the bending portion 2 of the flexible wiring substrate 9, i.e., an output terminal connection, and the drive driver 4, production of it is attained [that mounting cost is almost the same as the conventional liquid crystal display, and].

[0027] In addition, when the flexible wiring substrate 9 is a double-sided flexible wiring substrate, wiring connection is made through the through hole section of the aforementioned substrate at the input connector 6, and, in the case of an one side flexible wiring substrate, wiring connection of the electrode of light emitting diode 3 is made through the wiring inside a drive driver at the input connector 6.

[0028] Moreover, above (gestalt 1 of operation), although light emitting diode 3 was mounted in the direct flexible wiring substrate 9, even if this invention is not limited to this, it mounts two or more light emitting diodes 3 in the single printed circuit board 13 as shown in drawing 3, and it mounts this printed circuit board 13 in the flexible wiring substrate 9, the same effect is acquired.

[0029] (Gestalt 2 of operation) Drawing 4 shows the (gestalt 2 of operation) of this invention. although it is the almost same composition as drawing 1 which shows the above (gestalt 1 of operation) -- this (gestalt 2 of operation) -- **** -- light emitting diode 3 is formed in the outside instead of the inside of the bending section of the flexible wiring substrate 9, and it differs at the point constituted so that outgoing radiation of the light might be carried out toward optical incidence end-face 7a of a light guide plate 7

[0030] That is, a liquid crystal panel 10 is connected to a printed-circuit board 11 through the flexible wiring substrate 9, the flexible wiring substrate 9 is bent and mounted so that a liquid crystal panel 10 may lap with the component side of a printed-circuit board 11, optical incidence end-face 7a approaches the bending portion of the flexible wiring substrate 9 between the tooth back of a liquid crystal panel 10, and a printed-circuit board 11, the light guide plate 7 with which optical plane of incidence approaches and counters the tooth back of a liquid crystal panel 10 is infixed, and a liquid crystal display 12 is constituted.

[0031] And light emitting diode 3 is mounted in a printed-circuit board 11 so that the light source which

carries out outgoing radiation of the light toward optical incidence end-face 7a of a light guide plate 7 may be formed in the outside of the bending section of the flexible wiring substrate 9.

[0032] the flexible wiring substrate 9 located in the flexible wiring substrate 9 which constitutes the bending section between translucency or optical incidence end-face 7a and light emitting diode 3 in that case -- transparency of light -- preparing a hole -- the light from the light source -- further -- a light guide plate 7 -- incidence -- carrying out -- being easy -- a liquid crystal panel can be irradiated still more brightly

[0033]

[Effect of the Invention] Since the light source which illuminates a liquid crystal panel is made to approach the optical incidence end face of a light guide plate as mentioned above according to the liquid crystal display of this invention, it can consider as the lighting of sufficient luminosity.

[0034] Since display quality can manufacture often and cheaply, such a liquid crystal display can be used suitable for a cellular phone etc.

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TECHNICAL FIELD

[The technical field to which invention belongs] A liquid crystal panel is connected to a printed-circuit board through a flexible wiring substrate, and this invention relates to the liquid crystal display which displays the information on a printed-circuit board on a liquid crystal panel.

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PRIOR ART

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[0004] Drawing 5 and drawing 6 show the conventional liquid crystal display which mounted the drive circuit of a liquid crystal panel in the flexible wiring substrate. Drawing 5 (a) is the assembled result configuration, and drawing 6 (a) and (b) show the expansion state.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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[0014] Thus, since the light which once ran through the light guide plate 7 is reflected by reflector 8a of the resin case 8 and a liquid crystal panel 10 is irradiated, there is a problem that sufficient luminosity cannot be obtained.

[0015] this invention solves the aforementioned trouble and offers the liquid crystal display which can carry out transmitted illumination of the liquid crystal panel in sufficient luminosity.

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MEANS

[Means for Solving the Problem] The liquid crystal display of this invention is characterized by having made the light source which illuminates a liquid crystal panel approach the optical incidence end face of a light guide plate, and arranging it.

[0017] According to this invention, a liquid crystal panel can be illuminated with sufficient luminosity, and a liquid crystal display with sufficient display quality can be offered.

[0018]

[Embodiments of the Invention] In the liquid crystal display with which it connects with a printed-circuit board, and, as for a liquid crystal display according to claim 1, a liquid crystal panel displays the information on a printed-circuit board on it through a flexible wiring substrate at a liquid crystal panel

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The cross section of the liquid crystal display in (the gestalt 1 of operation)

[Drawing 2] The side elevation and plan which developed the liquid crystal display in (the gestalt 1 of operation)

[Drawing 3] The cross section of another liquid crystal display in (the gestalt 1 of operation)

[Drawing 4] The cross section of the liquid crystal display in (the gestalt 2 of operation)

[Drawing 5] The conventional cross section and conventional important section enlarged view of a liquid crystal display

[Drawing 6] The side elevation and plan which developed the conventional liquid crystal display

[Description of Notations]

1 Polarizing Plate

2 Output Terminal Connection

3 Light Emitting Diode

4 Drive Driver

5 Passive Circuit Elements

6 Input Connector

7 Light Guide Plate

8 Resin Case

9 Flexible Wiring Substrate

10 Liquid Crystal Panel

11 Printed-circuit Board

12 Liquid Crystal Display

13 Printed Circuit Board

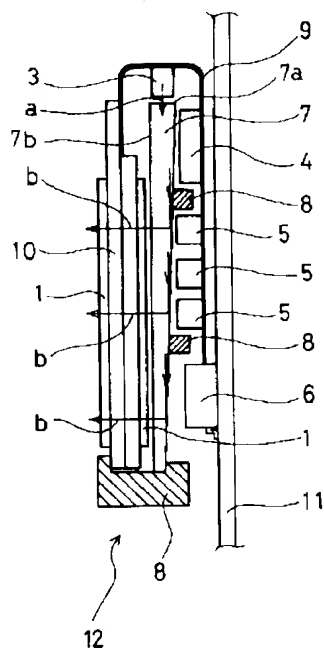
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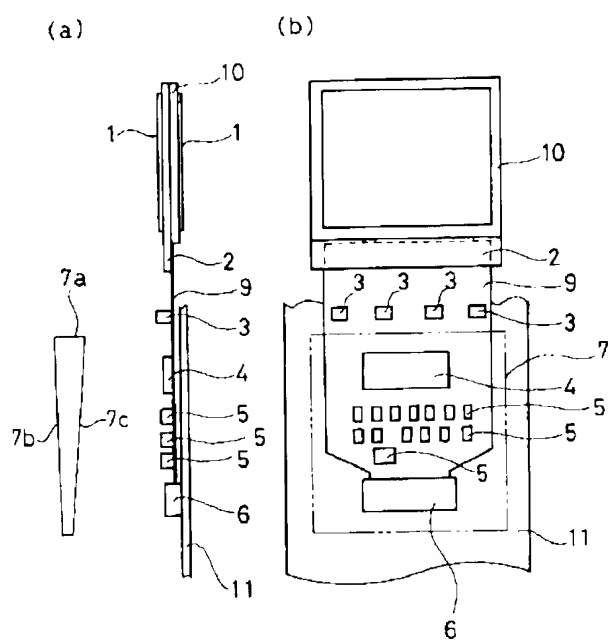
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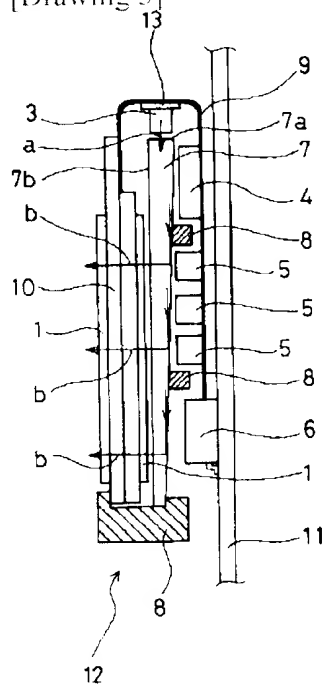
DRAWINGS



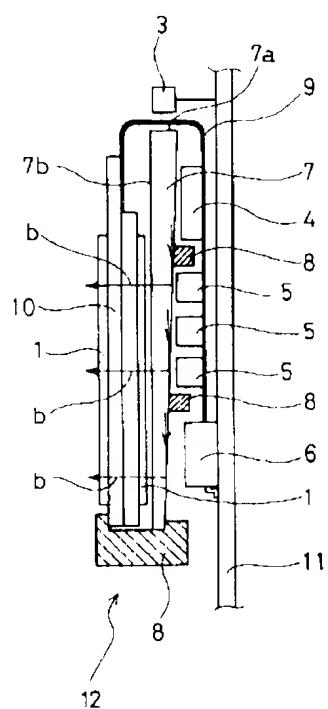
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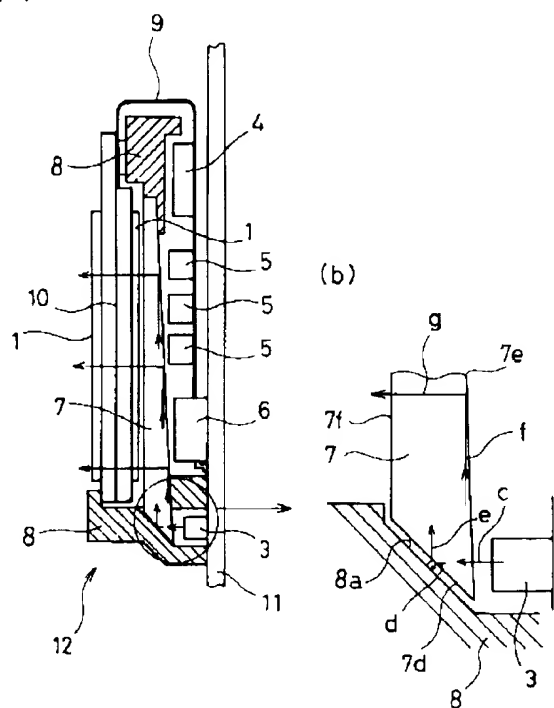
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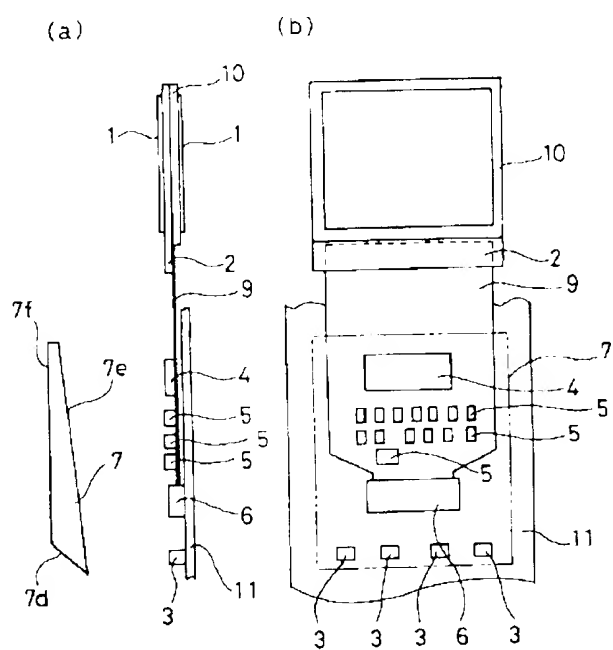
[Drawing 4]



[Drawing 5]
(a)



[Drawing 6]



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